The Extraction of Hops for Inhibition of Bacterial Growth

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Background

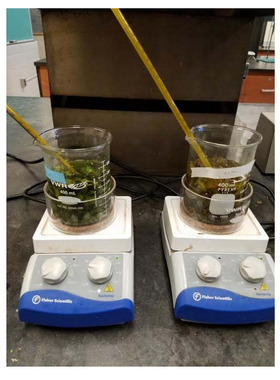
Hops are considered the flowers of the hop plant known as *Humulus lupulus*. They are utilized principally as an enhancer in the flavoring of beer and an agent of stability, to which they provide several different flavorings such as a bitter or citric taste. However they are utilized for different purposes in different beverage refreshments and herbal medicine.

Hops are composed of both alpha and beta acids. The alpha acids are probably the most important chemical compound within hops because they are responsible for the bitter taste of beer. The beta acids are sensitive to oxidative decomposition which may be detrimental to the taste of beer. For this reason, beta acids are known for being a negative factor in brewing beer and many brewers usually choose hops with a content that is low beta acid. Nonetheless, hops are also utilized in herbal teas and in soft drinks. These soft drinks include Julmust (a carbonated beverage similar to soda that is popular in Sweden), Malta (Latin American soft drink) and kvass (known in many Eastern European countries.

The ideal benefits of hops are unique in the field of medicine. Hops contain antimicrobial properties properties that may be beneficial to individuals who may be experiencing an illness or infection. This is because Gram-positive bacteria are known for being strongly inhibited by hop extracts, specifically by the alpha acids, while Gram-negative bacteria are not. In addition to the antimicrobial activities of this plant also has anti-inflammatory and enzymatic inhibition properties. All of these characteristics combined make hops an important plant to study.

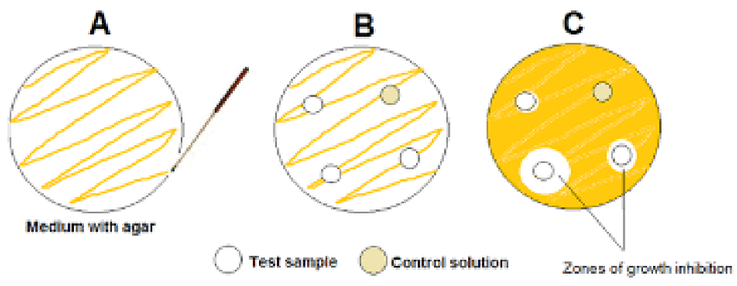
Extraction of Hops

The experiment involves the extraction of hops using three different solvents; distilled water, ethanol, and acetone. Each set of hops were consistently heated at a boiling temperature for 30 minutes. A minimum of 225 mL of each solvent were used per hops in order to maintain a consistent submergence below the solvent that was being used. The heated extractions were then filtered in order to separate the flowers of the hop from the liquid extract. In addition, the extract was re-filter through a sterile syringe in order to prevent unwanted pathogens such as, fungi, from growing.



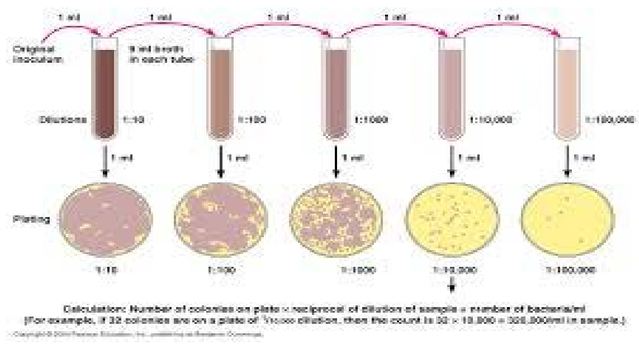
Disk Diffusion Assays

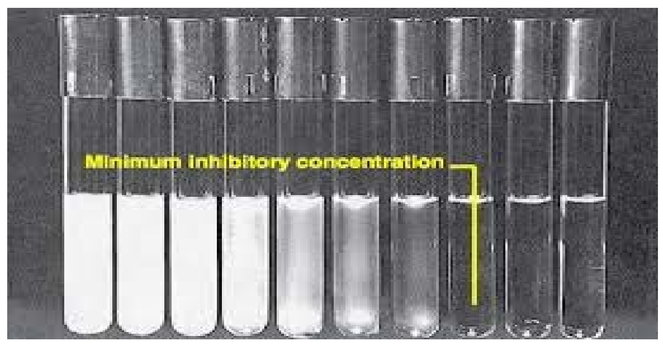
A disk diffusion was used in order to test the bacteria against each hop extraction. Doing so provided results as to which extraction inhibits bacterial growth.



Liquid Broth Dilutions to determine MIC

This method would be used to determine the smallest concentration of hops required to inhibit bacteria. In other words, the results of this test would show the lowest concentration of the antimicrobial agent content (MIC, minimal inhibitory concentration). For the most part, in defined test conditions, this will show the minimum amount that would inhibit the visibility of bacterial growth that is being investigated.





Re-Suspended Chart

The extraction of hops was re-suspended with its corresponding solvents. In other words, for every gram that was measured out for each extraction, one milliliter of the acetone or ethanol was added to the extract in order to re-suspend.

Hops	Re-suspension Amount	EtOH Extract	Added EtOH	Acetone Extract	Added Acetone
Zeus	1 g/mL	52g	52mL	50g	50mL
Cascade	1 g/mL	55g	55mL	50g	50mL
Magnum	1 g/mL	10.1g	10mL	10.08g	10mL
Mosaic	1 g/mL	10.1g	10mL	10.10g	10mL
Amarillo	1 g/mL	1.37g	1mL	2.01g	2mL
Saaz	1 g/mL	1.38g	1mL	2.04g	2mL

Conclusions

This research will show the fundamental and unique bacterial properties that hops contain. This research will not only show which bacteria are inhibited by hops but it will also show at what concentrations the hops extracts are inhibitory at.

In addition these results will contribute to the possible development of pharmaceutical drugs. These drugs would be useful for the medical treatment of inflammation and bacterial infection. The antimicrobial properties of the extracts of hops could also be utilized as a preservative for food in order to extend the shelf life and to increase the safety of fresh products.

References

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